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A NEW OLIGOCENE BRACHIOPOD FROM MEXICO

By W. S. Cole

November 24, 1929

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During the spring of 1927, I had the opportunity of collecting some samples from the *Lepidocyclina gigas* var. *mexicana* Cushman, *L. undosa* Cushman zone of the Meson formation of Mexico. This formation is approximately equivalent to the Glendon formation of Alabama, Florida and Georgia and of, at least, the lower part of the Antigua formation of Antigua.[1]

On examination of these samples, I found besides the Foraminifera, one species of Brachiopod belonging to the genus *Argyrotheca*. The abundance of this Brachiopod, together with its very perfect state of preservation, makes it desirable to describe this form.

Argyrotheca wegemanni, n. sp. **Plate 1**

Shell small, inequivalve, coarsely punctate. Pedicle valve the larger, flat, with a moderately elevated, bluntly pointed beak; brachial valve inflated with a wide straight cardinal margin; cardinal area is broadly trigonal with a very wide delthyrium; deltidial plates small, widely separated. Septum in ventral valve low and apparently uniform in elevation from the beak to the anterior margin; in the dorsal valve, septum very high, reaching an apex very near the anterior portion of the shell. Dental sockets on the dorsal valve weakly developed. Adults have 6 radial folds, making the anterior margin serrate; in young specimens, a slight fold developed, in the brachial valve, the pedicle valve, flat; in intermediate stages, a variation from two to the six folds of the adult.

Height 1.5mm.; width 1.8mm.; brachial valve (type).
Height 2.2mm.; width 1.8mm.; pedicle valve (type).
Thickness of both valves .6mm. (type).

Type locality.—From the *L. gigas* var. *mexicana* Cushman—*L. undosa* Cushman zone between km. posts 17-18 on the Aguila Petroleum Company's narrow-gauge railroad between Potrero and Tanhuijo,

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[1] Vaughan, T. W., Bull. Geol. Soc. Am., vol. 35, p. 732, 1924.

Cotypes.—My personal collection, U. S. National Museum and Cornell University Museum.

This species is named in honor of Mr. Carroll H. Wegemann, Chief Geologist of the Pan-American Petroleum and Transport Co., by whose permission this paper is published.

Associated with *Argyrotheca wegemanni* are numerous large and small Foraminifera. The fauna indicates a very shallow, tropical sea. Some of the more common described Foraminifera are:

L. (*Lepidocyclina*) *parvula* Cushman.
L. (*Nephrolepidina*) *gigas* var. *mexicana* Cushman.
    undosa Cushman
    crassata Cushman
Heterostegina antillea Cushman.
Eponides byramensis (Cushman).
Marginulina mexicana Cushman.
Siphonina advena Cushman.
Uvigerina byramensis (Cushman).

The genus *Argyrotheca* is well represented in the European Tertiaries and by nine species in the Tertiaries of the Americas. They are *A. dalli* Aldrich[2] (Eocene Alabama), *A. dalli* Cooke[3] (Eocene, St. Bartholomew), *A. powersi* Gardner[4] (Eocene, Texas) *A. berryi* Olsson,[5] *A. chica* Berry, *A. peruviana* Berry[6] (Eocene. Peru), *A. beecheri* (Clark), *A. plicatilis* (Clark)[7] (formerly considered Cretaceous, now Eocene) and *A. schucherti* Dall[8] (Miocene, Florida). In all probability, *A. peruviana* should be referred to *A. berryi* Olsson. There are also several species known from the recent American fauna.

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[2] Aldrich, T. H., Bull. Am. Pal., vol. 5, No. 22, pp. 13-14, pl. 5, figs. 9-10, 1911.

[3] Cooke, C. W., Carnegie Institution of Washington, No. 291, p. 152, pl. 16, figs. 5a-c, 1919.

[4] Gardner, J., Am. Jour. Sci., vol. 10, 5th series, pp. 134-138, figs. 1-8, 1925.

[5] Olsson, A. A., Bull. Am. Pal., vol. 15, No. 57, pp. 34-35, pl. 1, fig. 9, 10, 11, 1929.

[6] Berry, E. W., Jour. Was. Acad. Sci., vol. 19, No. 12, p. 239, figs. 10, 11, and 5-9, 1929.

[7] Clarke, W. B., Johns Hopkins Univ. Cir., vol. 15, No. 121, p. 3, fig. C and D, 1895.

[8] Dall, W. H., Trans. Wagner Free Inst. Sci. Phil., vol. 3, pt. 4, p. 1539, pl. 58, fig. 8, 1903.

[9] Thomas, A. O., Sci., n. s., vol. 54, p. 309, Sept. 1921.

Although Thomas[9] in a short communication to Science reports Brachiopods of the genera *Argyrotheca, Terebratulina* and *Liothyrina* from the Antigua limestone of Half Moon Bay, *A. wegemanni* is the first of this genus to be described from the American Oligocene.

Cossmann[10] figures 11 species from the Parisian Eocene and 4 species from the Eocene of Cotentin.[11]; von Koenen[12] records 3 species and varieties from the lower Oligocene of North Germany.

While *A. wegemanni* is distinct from the above mentioned American species, it is very near two European forms, namely, *A. crassicostata* (Baudon) and *A. Baudoni* (Desh). It is much smaller in size than either of these, and has typically a much larger delthyrium. The radial folds are not so strongly developed as in *A. Baudoni* and it lacks the sharply crenulated anterior margin of that form. *A. wegemanni* has stronger radial folds than *A. crassicostata* with consequently a more serrate anterior margin.

A. wegemanni is evidently sharply delimited in its vertical range, and I have not found it in any other samples than those from the true *L. gigas* var. *mexicana, L. undosa* zone of the Meson formation. It should be a splendid form for use in correlation, if it is found elsewhere.

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[9] Thomas, A. O., Sci., n. s., vol. 54, p. 309, Sept. 1921.

[10] Cossmann M. and Pissarro, G., Ico., des Coquilles des Environs de Paris, pl. 62, figs. 5-1 to 5-11, 1913.

[11] Cossman M. and Pissarro, G., Bull. Geol. Soc. de Normandie, vol. 24, pp. 65, 66, pl. 19, 1905.

[12] von Koenen, Abhandl. d. geol. Landesanstalt, Bd. X, Heft. C, taf. IIC.

Cornell University, Ithaca, N. Y.
September 27, 1929.

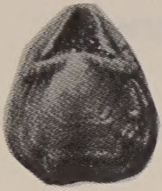
EXPLANATION OF PLATE 1

Argyrotheca wegemanni

1. View of brachial valve, x 10.
2. View of brachial valve of younger specimen x 10.
3. View of brachial valve of very young specimens x 10.
4. View of pedicle valve of same specimen as fig. 3, x 10.
5. View of brachial valve of adult specimen (type), x 10.
6. View of pedicle valve of adult specimen (type) x 10.
7. View of pedicle valve of type specimen, greatly enlarged to show structure, x 20.

8-9-10. View of pedicle valves of different specimens x 10.

11. Internal view to show median septum x 10.
12. Internal view of another specimen x 10.
13. Internal view of same specimen as figure 12, greatly enlarged x 20.
14. Side view of large specimen x 10.
15. Side view of small specimen, greatly enlarged x 20.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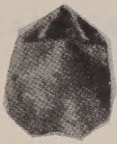
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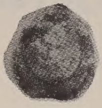
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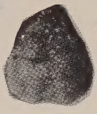
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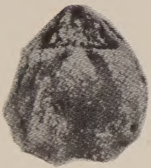
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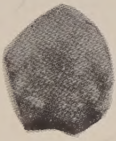
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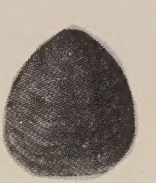
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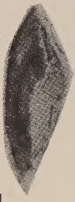
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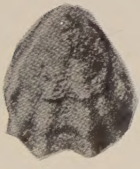
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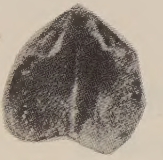
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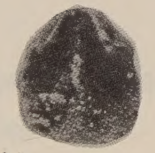
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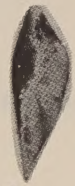
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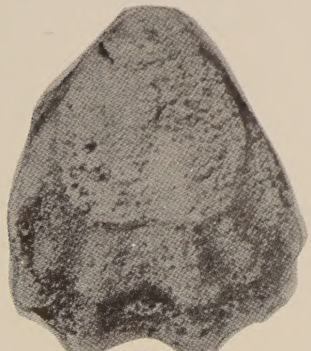
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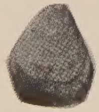
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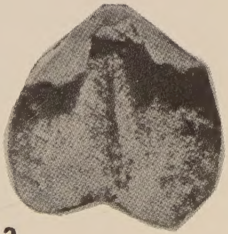
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Some Small Foraminifera from the Meson Formation of Mexico

By W. STORRS COLE and RUTH GILLESPIE

February 28, 1930

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SOME SMALL FORAMINIFERA FROM THE MESON FORMATION OF MEXICO

by

W. Storrs Cole[1]
and
Ruth Gillespie[2]

INTRODUCTION

The senior author was able to collect several samples from the *Lepidocyclina gigas* var. *mexicana, L. undosa* zone of the Meson formation of Mexico, during his work as micro-paleontologist for the Huasteca Petroleum Company at Tampico, Mexico.

Upon examination, these samples yielded a considerable fauna of large and small foraminifera, together with numerous individuals of a minute brachiopod which has been described by the senior author as *Argyrotheca wegemanni* Cole[3].

The large foraminifera indicate the correlation of this portion of the Meson formation with similar formations in the United States and the West Indies. No attempt will be made in this paper to describe any of the large foraminifera, as Dr. Vaughan in a personal communication, has informed the senior author that he intends to monograph them. The following list of large foraminifera as identified by us from our samples, is merely presented for correlation purposes:

Lepidocyclina (Lepidocyclina) parvula Cushman		Pl. 1, figs. 4, 5
Lepidocyclina (Nephrolepidina)	**undosa** Cushman	Pl. 1, figs. 1, 2
	undosa Cushman var. **tumida** Vaughan	
	gigas Cushman	Pl. 1, fig. 8
	gigas Cushman var. **mexicana** Cushman	
	crassata Cushman	Pl. 1, figs. 6, 7
Lepidocyclina sp.		Pl. 1, fig. 9
Heterostegina antillea Cushman		

We are figuring several sections of the *Lepidocyclina* forms for reference.

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[1] Instructor, Cornell University
[2] Graduate Student, Cornell University
[3] Cole, W.S., Bull. Am. Pal., vol. 15, No. 57a, pp. 119-122, pl. 17, 1929.

As Vaughan [4] [5] has pointed out, the Meson formation is of Middle Oligocene age, that is, the equivalent of the Antigua formation of Antigua, the Glendon formation of the Gulf States; limestone of Cayman Brac.; Moneague formation of Jamaica.

The small foraminifera also indicate Oligocene age as many of the forms common to the Vicksburg group of the Gulf States are present. They are, however, forms which in general range throughout this group. The following are common to both the Meson formation and the Vicksburg group of the United States:

Textularia subhauerii Cushman.
Clavulina byramensis Cushman.
Clavulina byramensis var. *extans* Cushman.
Lenticulina convergens (Bornemann).
Lenticulina rotulata (Lamarck).
Nodosaria longiscata d'Orbigny
Guttulina irregularis (d'Orbigny.)
Globulina gibba d'Orbigny.
Nonion advenus (Cushman).
Nonion scaphus (Fichtel and Moll) var. *mesonensis* n. var.
Virgulina compressa (Bailey) *Virgulina* sp. Cushman?
Uvigerina byramensis Cushman.
Discorbis vaughani Cushman.
Eponides byramensis (Cushman).
Eponides advena (Cushman).
Siphonina advena Cushman.
Siphoninella byramensis Cushman.
Asterigerina subacuta Cushman.
Globigerina bulloides d'Orbigny.
Cibicides americanus (Cushman).
Cibicides lobatulus (Walker and Jacob).
Cibicides pseudoungerianus (Cushman).

[4] Vaughan, T.W., Bull. Geol. Soc. Am., vol. 35, page 732, 1924
[5] Ibid., Quart. Jour. Geol. Soc., London, vol. 82, p. 391, 1926.

In this paper only four samples will be considered, two of which were collected from the main *Lepidocyclina* zone and two from just above. The two upper samples do not contain any *Lepidocyclina*.

The two Lepidocycline samples (S. C. 1 and 2) are from between km. posts 17-18, the other two (S. C. 3 and 4) from km. posts 18-18.5 on the Aguila Petroleum Company's narrow-gauge railroad between Potrero and Tanhuijo.

The specimens described in this paper are being retained for the present in the personal collection of the senior author.

To Mr. Carroll H. Wegemann, Chief Geologist of the Pan-American Petroleum and Transport Company, the authors acknowledge their indebtedness for permission to publish this paper.

Besides the forms which are described in some detail below, we have found one *Elphidium* which is very close to *E. advenum* (Cushman), a *Vaginulina* very similar to *V. legumen* (Linné), a *Textularia* cf. *T. conica* d'Orbigny and a *Lenticulina* of the type represented by Cushman's figure of *L. crepidula* from the Philippines. As we have only one specimen of each of the above, we are merely noting them for future reference.

DESCRIPTION OF SPECIES

Order, **FORAMINIFERA**

Family, **TEXTULARIIDÆ**

Genus, **TEXTULARIA**, Defrance 1824

Textularia, cf. **T gramen** d'Orbigny Pl. 3, fig. 12

Textularia gramen d'Orbigny, Foram. Foss. du Bassin Tert. Vienne, 1846, p. 248, pl. 15, figs. 4, 5.

The figured specimen is a young one. Later, we obtained more typical adult forms. These compare rather closely with d'Orbigny's figures.

Sample — S. C. 1, 2.

Textularia candeiana d'Orbigny Pl. 2, fig. 11

Textularia candeiana d'Orbigny, de la Sagra, Historie Physique, Politique et Naturelle de l'ile de Cuba, 1839, p. 143, pl. 1, figs. 25-27.

Textularia candeiana Heron-Allen and Earland, Trans., Zoo, Soc. Lond., vol. 20, pt. 17, 1915, p. 627, pl. 47, figs. 10-16.

There are a few specimens in the Meson which are referable to this species. Heron-Allen and Earland in their recent Foraminifera from the Kerimba Archipelago give a series of forms evidently belonging under one specific name. Most of our forms resemble their figure 14 rather closely. This is small, abbreviated, but has the general shape and arrangement of chambers as in the typical figure of d'Orbigny. The more elongate form does not seem to be present.

Sample — S. C. 2.

Textularia subhauerii Cushman

Textularia subhauerii Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 89, 126, pl. 14, figs. 2a, b.
Textularia subhauerii Cushman, Jour. of Pal., vol. 1, 1927, No. 2, p. 148, pl. 23, fig. 2.

The specimens from the Meson resemble Cushman's figure in the Byram Marl paper and also that in the Journal of Paleontology. Both megalospheric and microspheric individuals are present.

Sample — S. C. 1, 2.

Family, VERNEUILINIDÆ

Genus, CLAVULINA, d'Orbigny 1826

Clavulina byramensis Cushman

Clavulina byramensis Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 92, pl. 16, fig. 1.

This is a rather abundant species and corresponds very closely to the type.

Sample — S. C. 2.

Clavulina byramensis Cushman var. **extans** Cushman Pl. 4, fig. 8

Clavulina byramensis Cushman var. **extans** Cushman, U. S. Geol. Survey, Prof. Paper 133, 1923, p. 22, pl. 2, fig. 6.

We have found only two specimens which we consider belonging to this form. They appear to be typical as described by Cushman.

Sample — S. C. 1, 2.

Family, LAGENIDÆ

Genus, ROBULUS, Montfort 1808

Robulus midwayensis (Plummer) Pl. 2, fig. 12

Cristellaria midwayensis Plummer, Univ. Texas, Bull., No. 2644, 1926, pp. 95-96, pl. 13, figs. 5a-c.

We have compared our specimens with specimens in the collection of the senior author which were sent to him through the kindness of Mrs. Plummer. While we believe the Meson form shou'd be referred to the Midway species, the following slight differences were noted. The umbo is not so well developed in our specimens and the ribs over the sutures are not as heavy. This may be due to wear and state of preservation.

Sample — S. C. 1, 2.

Genus, LENTICULINA, Lamarck 1804

Lenticulina convergens Bornemann Pl. 3, fig. 1

Cristellaria convergens Bornemann, Zeitschr, deutsch. geol, Ges., vol. 7, 1855, p. 327, pl. 13, figs. 16, 17.

Cristellaria convergens Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 130.

Cristellaria convergens Cushman, U. S. Geol. Survey, Prof. Paper 133, 1923, p. 28, pl. 4, fig. 2.

There are specimens in the Meson which are referable to Bornemann's figure 16. We believe that his figure 17 should be a variety of this species. Specimens previously figured by Cushman from the Vicksburg and from the Alazan agree very closely with our specimens. All of these appear to have much more pronounced sutures and slightly less drawn out final chambers than in the original figure.

Sample — S. C. 1, 2, 3, 4.

Lenticulina cornellina, n. sp. Pl. 4, fig. 3

Test small, longer than wide, closely coiled with the exception of the final chamber which is produced; 6-8 chambers compose the last volution; umbilical area covered by a large, rather prominent knob of clear shell material; apertural face of the final chamber rounded; aperture terminal, produced, radiate.

Length, 0.52 mm. Width, 0.29 mm.

This is a very characteristic and easily recognized species with the knob of clear shell material and the final produced chamber. In some specimens this chamber tends to become almost uniserial.

Sample — S. C. 3, 4.

Lenticulina rotulata (Lamarck)

Lenticulites rotulata Lamarck, Ann. du Muséum, vol. 5, p. 188, No. 3, 1804; vol. 8, 1806, pl. 62, fig. 11.

Cristellaria rotulata Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 130, pl. 32, fig. 1.

The Meson specimens look exactly like the one figured by Cushman from the Mint Spring Marl.

Sample — S. C. 1, 2.

Genus, MARGINULINA, d'Orbigny 1826

Marginulina mesonensis, n. sp. Pl. 2, fig. 4.

Test elongate, compressed except the initial and final chambers which are slightly inflated, early chambers forming a portion of a coil, later chambers uniserial; sutures depressed, of clearer shell material; chamber walls covered by numerous very fine costae except the final chamber, aperture slightly radiate at the end of a very well developed neck, eccentric on the dorsal side.

Length, 0.55 mm.

Sample — S. C. 3.

This species greatly resembles *M. striatula* Cushman, particularly the one illustrated in the Atlantic fauna. It differs from this in its smaller size, more compressed form and slightly different shape. While the relationship is close, we feel that this species can be distinguished from the recent form.

The costæ are very fine and apparently do not cover the final chamber, which is smooth.

Marginulina mexicana Cushman Pl. 2, fig. 7

Marginulina mexicana Cushman, Contrib.· Cush. Lab. Foram, Res., vol. 1, 1925, pt. 3, p. 61, pl. 10, figs. 1a, b.

This is typical. It is quite distinct from *M. pulchra*. These two forms evidently form two distinct and separate zones within the Meson formation.

Sample — S. C. 1, 2, 3, 4 .(more abundant 3, 4.)

Genus, DENTALINA, d'Orbigny 1826

Dentalina mesonensis, n. sp. Pl. 4, fig. 7

Test strongly arcuate, sutures extremely oblique to the axis of the test, about 7 chambers composing the adult test; unornamented chambers; aperture slightly prolonged, radiate.

Length, 1.62 mm.

Sample — S. C. 4.

Genus, NODOSARIA, Lamarck 1812

Nodosaria longiscata d'Orbigny Pl. 4, fig. 1; pl. 3, fig. 9

Nodosaria longiscata d'Orbigny, Foram. Foss. du Bassin Tert, Vienne, 1846, p. 32, pl. 1, figs. 10-12.

Nedosaria ewaldi Reuss, Zeit. deutsch, geol. Gesel., vol. 3, 1851, p. 58, pl. 3, fig. 2.

Nodosaria filiformis Cushman (not d'Orbigny), U. S. Geol. Survey, Prof. Paper 129, 1922, p. 129, pl. 30, figs. 1-3.

Nodosaria ewaldi Cushman, Jour. of Pal., vol. 1, 1927, No. 1, p. 153, pl. 24, figs. 1, 2.

Nodosaria longiscata Nuttall, Quart, Jour. Geol. Soc., vol. 89, 1928, pt. 1, p. 81, pl. 4, fig. 13.

Various names have been applied to this form, but from a study of our specimens and the various illustrations representing these, we have concluded that there is not enough variation to warrant separate names. Reuss in his description of *ewaldi* claims that it may be distinguished by the more produced aperture. The amount that the aperture is produced is an individual characteristic rather than a specific one.

The Meson forms together with those figured by Cushman from the Vicksburg group have too elongated, cylindrical chambers to permit their being correlated with *N. filiformis* which typically has shorter, more inflated chambers.

Sample — S. C. 2, 3, 4.

Genus, LINGULINA, d'Orbigny 1826

Lingulina mesonensis Cole, n. sp. Pl. 1, fig. 3

Test large, compressed, unornamented, chambers about 5 in number, the middle three broad and short, the other two considerably larger and together comprising half the length of the test; sutures depressed; margin bluntly rounded, wavy in outline, entirely without any trace of a keel; aperture a compressed elongated slit, bordered by two slight lips.

Length, 3.9 mm. Width, 2.24 mm.

Sample — S. C. 1 and 2.

This species is comparatively rare in the Meson. It is nearest *L. grandis* Cushman from the Philippines, but that form has a keel and slightly different arrangement of chambers.

Family, POLYMORPHINIDÆ

Genus, GUTTULINA, d'Orbigny 1826

Guttulina irregularis (d'Orbigny)

Cushman in his Contributions (vol. 5, pt. 4, p. 89) states that "*Polymorphina byramensis* Cushman" is a synonym of this species. As he is publishing a complete note on this form, we will merely state that our Meson forms are the same as the so-called "*P. byramensis.*"

Sample — S. C. 2.

Sub-genus, GLOBULINA, d'Orbigny 1826

Globulina gibba d'Orbigny

Polymorphina (Globulina) gibba d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 226, No. 20, Modèles, No. 63.

Polymorphina gibba Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 93, pl. 17, fig. 3.

A few typical specimens were found.

Sample — S. C. 1, 2, 3.

Family, NONIONIDÆ

Genus, NONION, Montfort 1808

Nonion advenus (Cushman) Pl. 2, fig. 15

Nonionina advena Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 139, pl. 32, fig. 8.

Very rare. Cushman reports this form only from the Mint Spring member, however Howe later reported it from the Red Bluff Clay. It probably has a longer range than was at first believed.

Sample — S. C. 2.

Nonion scaphus (Fichtel and Moll) var. **mesonensis**, n. var. Pl. 2, fig. 3

Test differing from the typical in the lesser number of chambers in the last volution and the more elongate, embracing shape of the final chambers.

Length, 0.38 mm.

One of the forms figured by Cushman from the Byram Marl belongs under this variety. It is very close to the figures given by Fichtel and Moll, but can be separated from that form on the characters listed above.

Sample — S. C. 1, 2, 3, 4.

Genus, ELPHIDIUM, Montfort 1808

Elphidium sagrum (d'Orbigny)

Polystomella sagra d'Orbigny, de la Sagra, Histoire Physique Politique et Naturelle de l'ile de Cuba, 1839, p. 77, pl. 5, figs. 13 to 15.

Typical. The last chamber is smooth and the specimens otherwise agree with d'Orbigny's figures and description.

Sample — S. C. 1.

Family, BULIMINIDÆ

Genus, BULIMINA, d'Orbigny 1826

Bulimina ovata d'Orbigny Pl. 2, fig. 5

Bulimina ovata d'Orbigny, Foram, Foss. du Bassin Tert. Vienne, 1846, p. 185, pl. 11, figs. 13, 14.

The Meson specimens are very close to the species described by d'Orbigny from the Vienna Basin. The chambers of our specimens seem slightly more inflated, but the general arrangement and size seems to warrant our referring it to d'Orbigny's species. The smooth Buliminas are in a very unsatisfactory condition and need more study in order to separate the various ones which have been grouped under the specific name *ovata.*

Sample — S. C. 1, 2, 3.

Genus, **VIRGULINA,** d'Orbigny 1826

Virgulina compressa (Bailey) Pl. 2, fig. 8

Bulimina compressa Bailey, Smithsonian Contrib., vol. 2, 1851, Art. 3, p. 12, figs. 35-37.

Virgulina compressa Cushman, U. S. Nat. Mus., Bull. 104, 1922, p. 116, pl. 24, figs. 2, 3.

This is very similar to the recent forms. The general shape, size and position of the sutures is the same; figure (2) given by Cushman in the Atlantic foraminifera, is an exact duplicate of our specimens.

Sample — S. C. 1, 2, (rare 3, 4).

Genus, **UVIGERINA,** d'Orbigny 1826

Uvigerina byramensis Cushman Pl. 2, fig. 6

Uvigerina byramensis Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 95, 133, pl. 18, fig. 5.

This is one of the most numerous small fossils occurring at this horizon. It follows Cushman's description and compares exactly with specimens in the senior author's collection from the Byram Marl.

Sample — S. C. 1, 2, 3, 4.

Uvigerina byramensis Cushman var. **mesonensis,** n. var.

Test differing from the typical in its more compact less elongate form; the uniserial chambers not so pronounced; other characters similar.

Length, 0.37 mm.

Sample — S. C. 1, 2, 3, 4.

Family, **ROTALIIDÆ**

Genus, **DISCORBIS,** Lamarck 1804

Discorbis subaraucana Cushman, Pl. 3, figs. 2, 3

Discorbis subaraucana Cushman, Carnegie Inst. of Washington, vol. 17, 1922, p. 41, pl. 7, figs. 1, 2.

The fossil specimens are almost exactly like the recent form described by Cushman from the Tortugas region. The only differences noted were that our specimens have a slightly lobate outline and the umbilicus is deeper. The size, position and character of the sutures together with its general features, makes it desirable to refer the Meson specimens to the recent until actual specimens can be compared.

In our figure of this form the artist over-emphasized the umbilical area which is not nearly as prominent in most specimens.

Sample — S. C. 1, 2, 3, 4.

Discorbis vaughani Cushman

Discorbis patelliformis Cushman (not H. B. Brady), U. S. Geol. Survey, Prof. Paper 133, 1923, p. 38, pl. 6, figs. 3, 4.

Discorbis vaughani Cushman, Jour. of Pal., vol. 1, 1927, No. 2, p. 164 pl. 25, figs. 5, 6.

This fossil occurs very rarely in the Meson. Cushman has reported it from the Alazan (Lower Oligocene). It evidently has a very long vertical range.

Genus, EPONIDES, Montfort, 1808

Eponides advena (Cushman)

Rotalia advena Cushman, U. S. Geol. Survey, Prof. Paper 133, 1923, p. 46, pl. 7, figs. 4-6.

This is a rare species in the Meson. It appears to be quite typical with the type as described by Cushman.

Eponides byramensis (Cushman) Pl. 2, figs. 1, 2

Pulvinulina byramensis Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 99, 138, pl. 22, figs. 4, 5.

This is one of the most abundant forms. It is typical and compares exactly with Cushman's original description and figures. It has a wide vertical and horizontal range in both the Vicksburg group and the Meson formation. It is the most abundant species in samples S. C. 3, 4 and less abundant in S. C. 1, 2.

Genus, SIPHONINA, Reuss 1849

Siphonina advena Cushman Pl. 4, figs. 5, 6

Siphonina advena Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 98, 137, pl. 22, figs. 1, 2.

This is a common and abundant form in the Meson.

Sample — S. C. 1, 2 very abundant, 3, 4 rare.

Genus, SIPHONINELLA, Cushman 1927

Siphoninella byramensis Cushman Pl. 3, figs. 4, 5

Siphoninella byramensis Cushman, Contrib. Cush. Lab. Foram. Res., vol. 5, 1929, No. 2, p. 46, pl. 8, figs. 5a-c.

This interesting form occurs in some numbers. To date, this form has been only reported from the Byram Marl.

Sample — S. C. 3.

Family, AMPHISTEGINIDÆ

Genus, ASTERIGERINA, d'Orbigny 1839

Asterigerina subacuta Cushman

Asterigerina subacuta Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 100, pl. 24, figs. 1-3.

A few very poor specimens are referred temporarily to this species.

Sample — S. C. 1.

Family, GLOBIGERINIDÆ

Genus, GLOBIGERINA, d'Orbigny 1826

Globigerina apertura Cushman Pl. 2, fig. 13

Globigerina apertura Cushman, U. S. Geol. Survey, Bull. 676, 1918, p. 57, pl. 12, fig. 8.

A few *Globigerina* with very large apertures are referred to this species, originally described by Cushman form the Miocene of the United States. The shape of the chambers, together with the large size of the aperture would preclude it from being referred to any other species.

Sample — S. C. 3.

Globigerina bulloides d'Orbigny Pl. 2, fig. 16

Globigerina bulloides d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, No. 1, p. 277, Modèles 17, 76.

Globigerina bulloides Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 95, 134, pl. 19, figs. 1-3.

There are numerous specimens which may be referred to this species. Our specimens are much like those from the Byram Marl. However, so many different illustrations are given for this form that it is hard to show definitely just how much variation should be allowed.

Sample — S. C. 1, 2, 3, 4.

Globigerina eocaenica Terquem Pl. 2, fig. 14

Globigerina eocaenica Terquem, Mem. Soc. Geol. de France, ser. 3, vol. 2, 1882, p. 86, pl. 9, fig. 4.

Globigerina eocaenica Cole. Bull. Am. Pal., vol. 14, 1928, No. 53, p. 17, pl. 1, fig. 10; pl. 3, fig. 8.

Specimens from the Meson agree very closely with specimens from the Chapapote referred by the senior author previously to this species. The general arrangement of chambers and aperture is exactly as described by Terquem. The umbilical area of our specimen is slightly more prominent.

Sample — S. C. 1, 3, 4.

Globigerina rubra d'Orbigny Pl. 2, figs. 9, 10

Globigerina rubra d'Orbigny in de la Sagra, Histoire Physique, Politique et Naturelle de l'ile de Cuba, Foraminiféres, 1839, p. 94, pl. 4, figs. 12-14.

There are a few specimens referable to this species. The supplementary apertures are not as pronounced as in d'Orbigny's figures, but this may be due to the filling in fossilization.

Sample — S. C. 1.

Genus, **PULLENIATINA**, Cushman 1927

Pulleniatina obliquiloculata (Parker and Jones) Pl. 3, figs. 6, 7

Pullenia obliquiloculata Parker and Jones, Philos, Trans., vol. 155, 1865, p. 368, pl. 19, figs. 4a, b.

Pullenia obliquiloculata Brady, Rept. Voy Challenger, Zoo., vol. 9, 1884, p. 618, pl. 84, figs. 16-20.

Our specimens compare very closely with figures given by other authors, particularly Brady. It is of interest to find this species in the Oligocene in a shallow water deposit. Enough specimens were found to give us a complete series of all ages.

Sample — S. C. 1, 2.

Family, **ANOMALINIDÆ**

Genus, **CIBICIDES**, Montfort 1808

Cibicides americanus (Cushman) Pl. 4, fig. 4

Truncatulina americana Cushman, U. S. Geol. Survey, Bull. 676, 1918, p. 63, pl. 20, figs. 2, 3; pl. 21, fig. 1.

Truncatulina americana Cushman U. S. Nat. Mus. Bull. 103, 1918, p. 68, pl. 23, figs. 2a-c.

Truncatulina americana Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, p. 97, pl. 20, figs. 7-8.

The placing of this form generically[6] is rather unsatisfactory due primarily to d'Orbigny's original and subsequent descriptions of his genus *Anomalina.* In his first description (Ann. Sci. Nat. 1826) he states *"ouverture lateral en fente,"* in 1839 in the Cuba monograph he is more explicit saying *"ouverture en fente, situeé a la region ombilicale, souvent continuant d'une loge a l'autre"* and still later, 1846, in the Vienna monograph he still modifies his original description so that *Anomalina* is apparently similar to *Truncatulina,* except that *Anomalina* is free and has no spire. *Cibicides* because of its attached mode has modified its test from that of *Anomalina.*

Our form was evidently attached at least for part of its life, but a spire has not been developed. It is evident that this is an intermediate stage between the true *Anomalina* and *Cibicides.*

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[6] Much of the material in this discussion was taken from a personal communication to the senior author by Dr. Cushman. The original literature was also consulted.

Because of its apparent mode of life and modification toward the *Cibicides* form, we prefer to classify it with *Cibicides*.

While Cushman used the specific name *americana* to describe both a species in his Coastal Plain Paper and also in his Panama Papers, it seems to us that all these forms are similar enough to be placed under one specific name than to create a new name for the Oligocene forms.

Sample — S. C. 1, 2, 3, 4.

Cibicides elongatus (d'Orbigny) Pl. 3, fig. 8; pl. 4, fig. 9

Truncatulina elongata d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, No. 2, p. 279.

Truncatulina elongata Terquem, Mém. Soc. Geol. de France, ser. 3, vol. 2, 1882, pp. 93, 94, pl. 17, figs. 26a, b.

There are some specimens which we are placing under this specific name. Some of our specimens agree exactly with the figures given by Terquem; some are more irregular. These forms, however, may not constitute a separate species, but represent a degenerate form of *C. lobatulus*. There appears to be some gradational specimens between the two extremes. For the present, until a more perfect connection between the two can be made, we are using both names.

Sample — S. C. 1 (abundant), 3, 4, (very rare.)

Cibicides lobatulus (Walker and Jacob) Pl. 4, fig. 2

Nautilus lobatulus Walker and Jacob, Adams Essays on the microscope, Kanmacher's ed. 1798, p. 642, pl. 14, fig. 36.

Truncatulina lobatula Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 96, 135, pl. 20, figs. 1-3.

As Cushman has already pointed out, the forms referred by him to this species are not all typical. Our specimens, however, agree very closely with his descriptions and figures of similar forms from the Vicksburg group.

Sample — S. C. 1, 2 (abundant), 3, 4 (rare).

Cibicides pseudoungerianus (Cushman) Pl. 3 figs. 10, 11

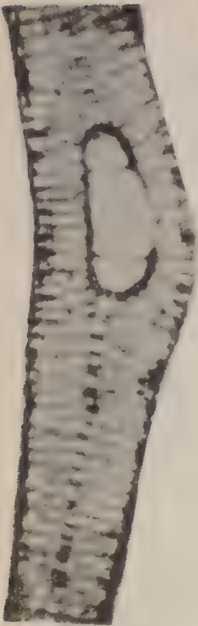
Truncatulina pseudoungeriana Cushman, U. S. Geol. Survey, Prof. Paper 129, 1922, pp. 97, 136, pl. 20, fig. 9.

While most of our specimens are smaller than those which we have seen from the Byram Marl, they present the same characters generally assigned to this form. For the present, we are referring our specimens to this species, although they may represent a variety.

Sample — S. C. 1, 2, 3, 4.

PLATE 1

1. **L. (Nephrolepidina) undosa** Cushman; vertical section; X 10 . . . 3
2. **L. (Nephrolepidina) undosa** Cushman; horizontal section; X 10 3
3. **Lingulina mesonensis** Cole, n. sp.; holotype; X 10 9
4. **L. (Lepidocyclina) parvula** Cushman; vertical section; X 20 3
5. **L. (Lepidocyclina) parvula** Cushman; horizontal section; X 20 3
6. **L. (Nephrolepidina) crassata** Cushman; vertical section of a young specimen; X 10 3
7. **L. (Nephrolepidina) crassata** Cushman; vertical section; X 10 3
8. **L. (Neprolepidina) gigas** Cushman; horizontal section; X 10 3
9. **Lepidocyclina** sp.; vertical section; X 10 3



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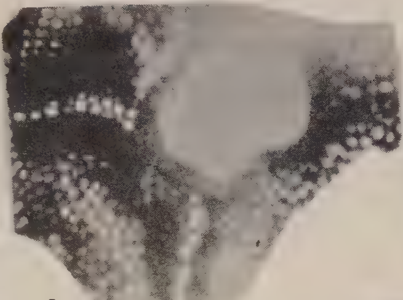

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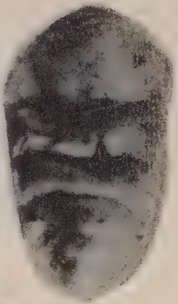

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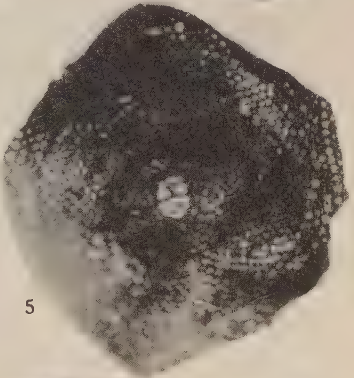

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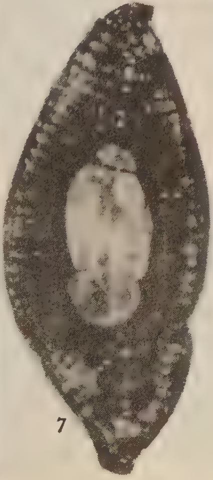

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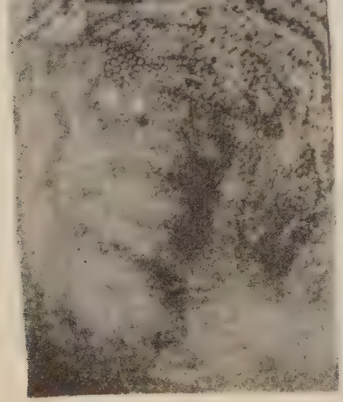

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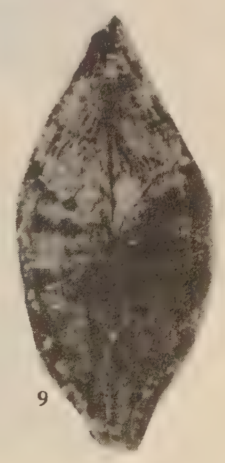

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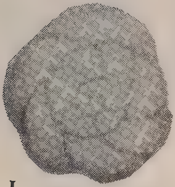
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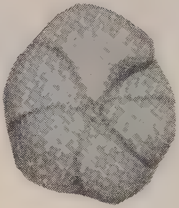
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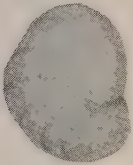
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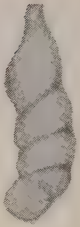
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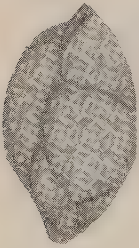
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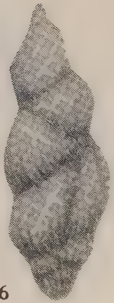
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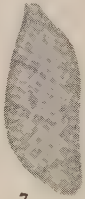
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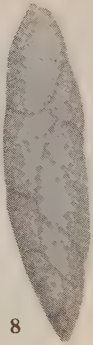
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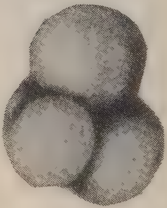
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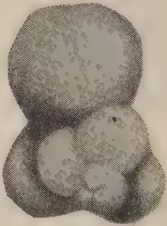
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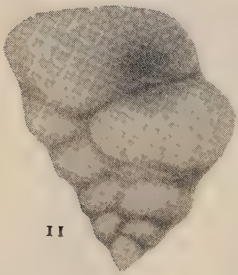
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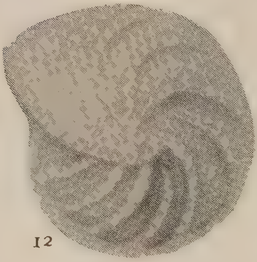
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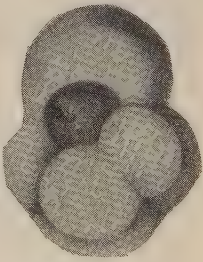
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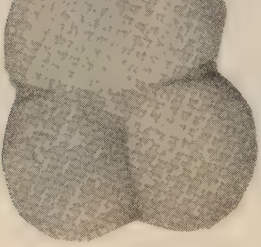
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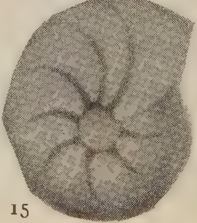
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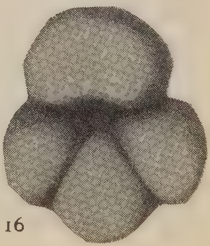
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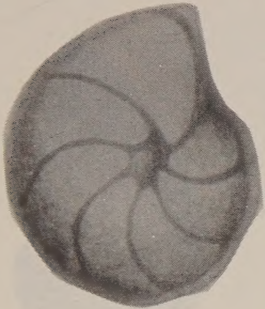
PLATE 2

1. **Eponides byramensis** (Cushman); dorsal view; X 50 … 12
2. **Eponides byramensis** (Cushman); vertical view; X 50 … 12
3. **Nonion scaphus** (Fichtel and Moll) var. **mesonensis,** n. var.; side view; holotype; X 55 … 10
4. **Marginulina mesonensis** n. sp.; side view; holotype X 50 … 8
5. **Bulimina ovata** d'Orbigny; X 85 … 10
6. **Uvigerina byramensis;** X 85 … 11
7. **Marginulina mexicana** Cushman; side view of a very young specimen; X 50 … 8
8. **Virgulina compressa** (Bailey); X 85 … 11
9. **Globigerina rubra** d'Orbigny; ventral view; X 85 … 14
10. **Globigerina rubra** d'Orbigny; dorsal view; X 85 … 14
11. **Textularia candeiana** d'Orbigny ; X 85 … 5
12. **Robulus midweyensis** (Plummer); side view; X 30 … 6
13. **Globigerina apertura** Cushman; ventral view; X 85 … 13
14. **Globigerina eocaenica** Terquem; ventral view; X 85 … 13
15. **Nonion advenus** (Cushman); side view; X 85 … 10
16. **Globigerina bulloides** d'Orbigny; ventral view; X 85 … 13

PLATE 3

Fig.		Page
1.	**Lenticulina convergens** (Bornemann); side view; X 85	7
2.	**Discorbis subaraucana** (Cushman); dorsal view; X 85	11
3.	**Discorbis subaraucana** (Cushman); ventral view; X 85	11
4.	**Siphoninella byramensis** Cushman; ventral view; X 85	12
5.	**Siphoninella byramensis** Cushman; dorsal view; X 85	12
6.	**Pulleniatina obliquiloculata** (Parker and Jones); adult specimens; 85	14
7.	**Pulleniatina obliquiloculata** (Parker and Jones); very young specimen; X 85	14
8.	**Cibicides elongatus** (d'Orbigny); ventral view of small specimen; X 85	15
9.	**Nodosaria longiscata** d'Orbigny; X 55	8
10.	**Cibicides pseudoungerianus** (Cushman); dorsal view; X 85	15
11.	**Cibicides pseudoungerianus** (Cushman); ventral view; X 85	15
12.	**Textularia** cf. **T. gramen** d'Orbigny; X 85	5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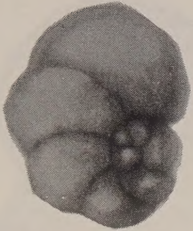
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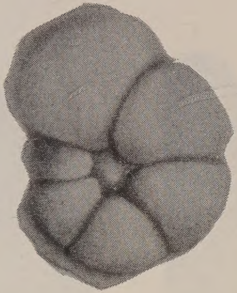
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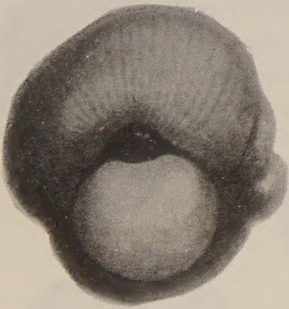
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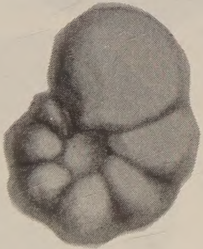
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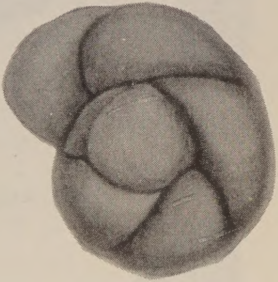
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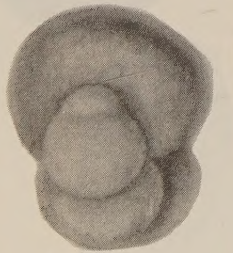
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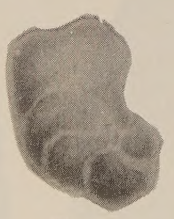
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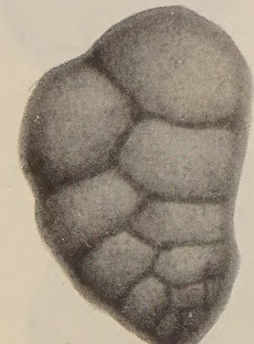
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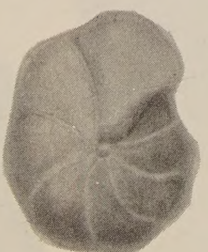
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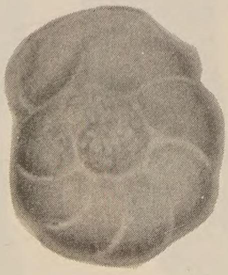
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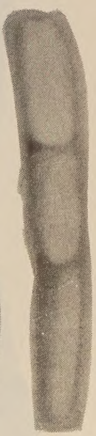
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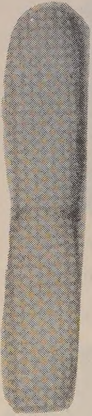

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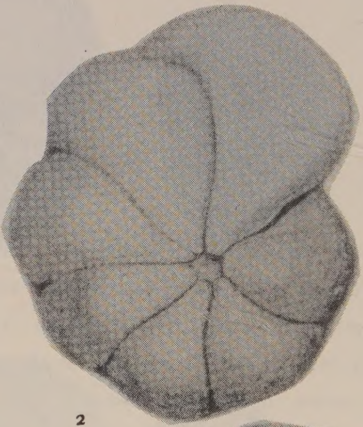

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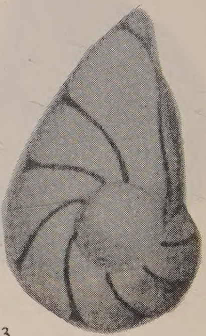

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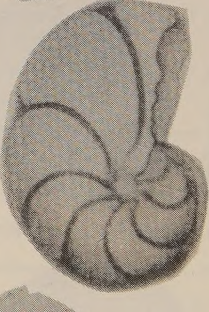

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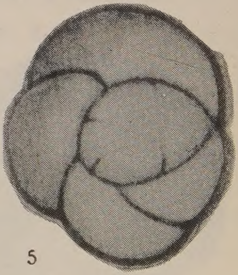

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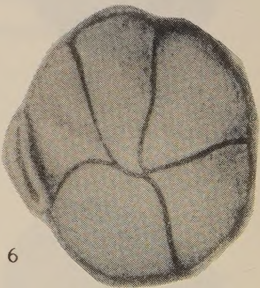

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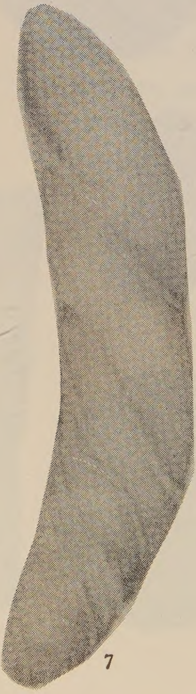

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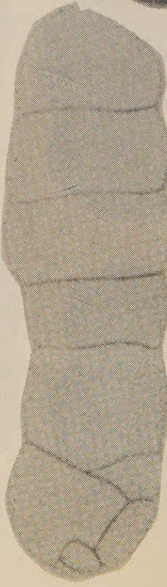

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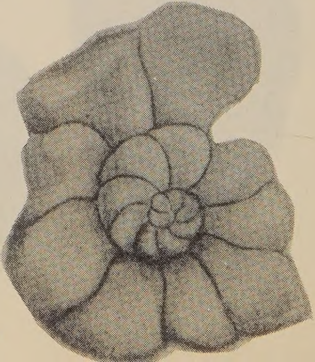
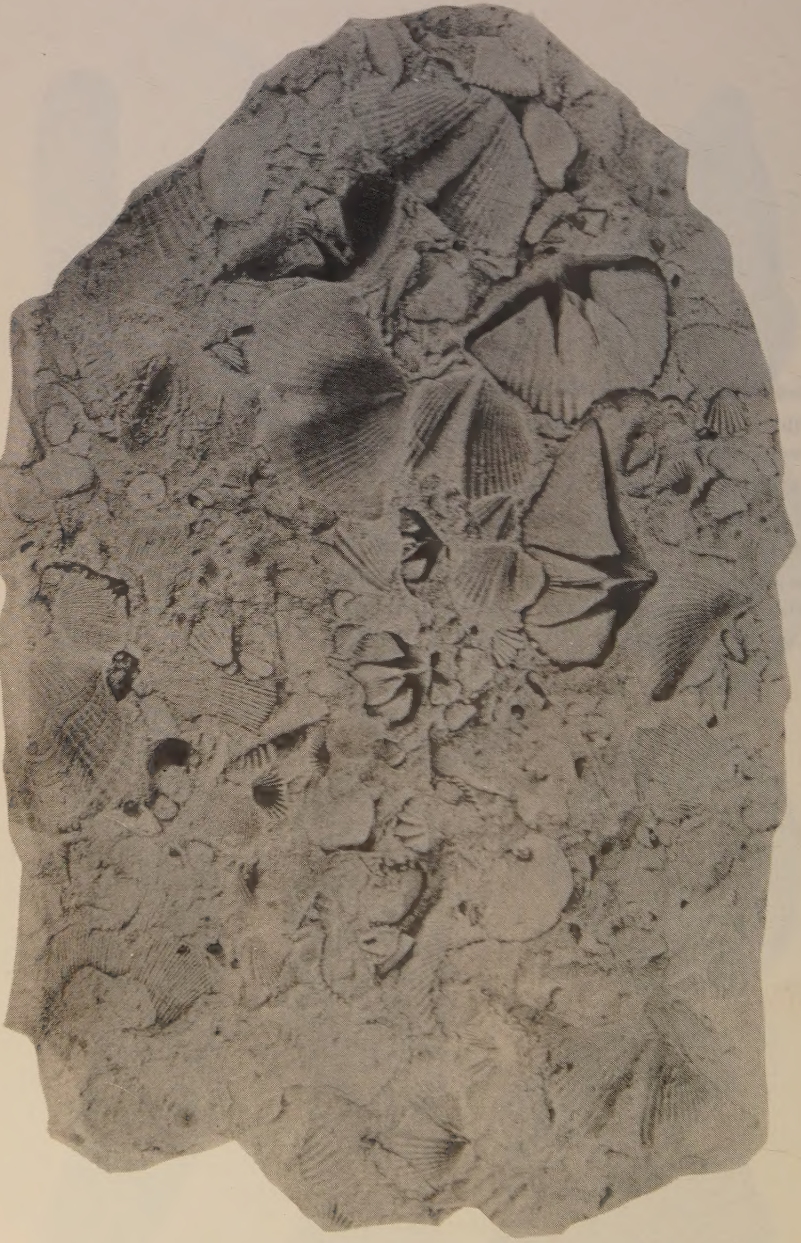


9

PLATE 4

1. **Nodosaria longiscata** d'Orbigny; X 55 8
2. **Cibicides lobatulus** (Walker and Jacob); ventral view; X 85 15
3. **Lenticulina cornellina** n. sp., side view; holotype; X 85 7
4. **Cibicides americanus** (Cushman); dorsal view; X 85 14
5. **Siphonina advena** Cushman; dorsal view; X 85 12
6. **Siphonina advena** Cushman; ventral view; X 85 12
7. **Dentalina mesonensis** n. sp.; holotype; X 85 8
8. **Clavulina byramensis** var. **extans.** Cushman; outline; X 30 6
9. **Cibicides elongatus** (d'Orbigny); dorsal view; X 85 15



Slab of Mississippian sandstone from Stone Hill, near Warren, Pennsylvania. This is the fossiliferous 'Venango First Oil sand' horizon. Photo natural size.